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Efect of Nitrogen on Yield and Other Plant Characters of Local T. Aman Rice, Var. Jatai

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Abstract: A field experiment was carried out during aman season, 2003 at the experimental field of Agrotechnology Discipline, Khulna University, Khulna to study the effect of nitrogen on different characteristics of transplanted local aman rice variety, Jatai .The levels of nitrogen used in this study were 0, 20, 40, 60 and 80 kg ha^{-1}. Results of this study reveled that different agronomic characteristics varied significantly among the treatments. Higher N dose produced higher plant height. The highest effective tiller $hill^{-1}$, panicle length, filled grains $panicle^{-1}$, 1000-grain weight and grain yield was obtained with 40 kg N ha^{-1}. The highest and lowest biological yield was produced with 40 kg N $ha^{-1}$and 0-kg N ha^{-1} respectively.

Key words: Rice, Local variety, Nitrogen fertilizer and Yield.

INTRODUCTION

Rice (*0ryza sativa* L.) is the principal food crop of Bangladesh. Among the rice groups grown in the country transplanted Aman rice is the most important. Bangladesh has a large number of rice cultivars and land races. With the introduction of high yielding varieties (HYV) the number of indigenous varieties under cultivation has dwindled drastically. Local Aman rice is the only source of cash income for many farmers of coastal region of Khulna district. Yield potentials of many of the old varieties have not been examined[3]. Research works reported earlier[2] emphasized little on the response of the old varieties to management practices. Under this situation along with improved cultural management, the use of balanced fertilizer is one of the most important ways for increased crop productivity. Fertilizer is now one of the expensive inputs for crop production in Bangladesh. Among various nutrients, nitrogen has the strongest influence on the growth and yield of rice. Nitrogen is one of the major nutrients, which is required in adequate amount at early, mid tillering and panicle initiation and at ripening stage for better grain development[9]. Nitrogen is the element most often required for high yield of rice. Many researchers have done many fertilizer experiments on the reaction of certain varieties to various nitrogen levels[4]. Nitrogen fertilizer increases tillering and vegetative growth, increases plant height, grain and straw yield and number of heads usually are proportionally to the amount of nitrogen added[8]. Almost all the soils of Bangladesh are low in organic matter and hence of nitrogen[6]. Among many factors, deficiency of N is now considered as major reason for low yield of rice in saline region of Bangladesh. At present, the farmers of Bangladesh use increased amount of nitrogen fertilizer to get higher yield[1].

For this reason the present research work was undertaken to study the yield performance of local transplanted aman rice variety, Jatai under different Nitrogen levels and to determine optimum N dose for this variety for obtaining maximum yield.

MATERIALS AND METHODS

The experiment was conducted in Aman season (June-December) of 2003 at the experimental field of Agrotechnology Discipline, Khulna University, Khulna, situated in the Agroecological zones (AEZ) 13.The experimental field belongs to the soil physiographic unit of Ganges Tidal Flood Plain soil Tract series.

The experimental field was typical rice growing medium highland of clay soil. Five levels of N (0, 20,40, 60, 80 kg ha^{-1}) were tested. The local variety of this region, Jatai was selected for research work. The experiment was laid out in a Randomize Complete Block Design (RCBD) with five treatments and three replications. The unit plot size was 5- x 3-m. Besides nitrogen, experimental fields were fertilized with triple super phosphate, murate of

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potash and gypsum @ 100 kg, 35kg and 5kg ha^{-1} respectively. A full dose of P, K and S was applied at the final land preparation. Urea, as a source of nitrogen was applied in four splits. First 1/3 urea was given in two equal parts as basal dose and at 10 DAT. Rest of the 2/3 N was topdressed in two equal splits, at 25DAT and 50DAT.

Forty-five days old seedlings were transplanted @ 3 seedlings hill^{-1} with 20- x 20- cm spacing. Gap filling was done within one week of transplanting. Weeding and insecticide were applied as and when necessary.

Data were recorded from five consecutive selected hills in each plot. Grain and straw yields were recorded from the whole plot basis. The grain and straw weight were expressed in ton (t) hectare^{-1} . The 1000grain weight was taken from dried grain samples of each unit plot.

The collected data were analyzed following the analysis of variance (ANOVA) technique and mean differences were adjusted by Duncan,s Multiple Range Test(DMRT)[5] using a computer operated program named MSTAT.

RESULTS AND DISCUSSIONS

Plant height: Levels of N fertilizer significantly affected plant height. Plant height ranged from 140.16cm to 155.86 cm. The highest plant height was produced by 80 kg N ha^{-1} and decreased gradually with decreased levels of N fertilizer application. Plants receiving no nitrogenous fertilizers were significantly shorter than other treatments. This trend in plant height is in agreement with the reporting of Tanaka[13] and Talukder[12] (Fig. 1).

Effective tillers: It was observed in the present investigation that the number of effective tiller hill^{-1} increased with increasing the level of N up to 40kg ha^{-1}, and after that gradually decreased. Forty-kg N ha^{-1} proved to be best dose for obtaining maximum effective tiller hill^{-1}, although 40 and 60 kg N ha^{-1} yielded similar results statistically for this parameter. The lowest number of effective tillers was obtained when no N fertilizer was applied. Similar results have been obtained by Singh and Arya[10] and Jasim *et al*[7].

Panicle length: Panicle length varied significantly due to N fertilizer in all the treatments as shown in Table 1. Highest panicle length was obtained by applying 40kg ha^{-1}, that was statistically similar with 0 and 20 kg ha^{-1}. With further increase in the levels of N length of panicle decreased. No significant differences were found in panicle length when N applied at the rate of 60 and 80kg ha^{-1}. Lower N doses were found to be more favorable for longer panicle.

Number of filled grains panicle^{-1}: Nitrogen fertilizer management significantly affected the number of filled grain panicle^{-1}. Twenty and 40kg N ha^{-1} were found more effective for obtaining maximum number of filled grain panicle^{-1}.

Weight of 1000 grains (g): Weight of 1000 grains is one of the most important parameter among the yield contributing characters and it was affected significantly by N application in the present study (Table 1). Application of nitrogen fertilizer @ 40 kg ha^{-1} produced maximum weight of 1000-grains (29.34 g), which was significantly higher than the results obtained in other treatments.

Grain yield (t ha^{-1}): Data on grain yield were variable, ranging from 2.49 to 4.02 t ha^{-1} (Table 1). Results showed that the maximum grain yield (4.02 t ha^{-1}) was produced when N was applied @ 40 kg ha^{-1}, which was significantly different from other treatments. With further increase in N, grain yield was not increased. Singh and Pillai[11] reported that grain yield increased with increasing nitrogen fertilizer upto a certain level and then decreased. Similar trend in grain yield was observed in the present investigation.

Biological yield: The effect of nitrogen on biological yield was significant and ranged between 9.14 t ha$^{-1`}$ and 12.18 t ha$^{-1`}$ The highest biological yield was produced by 40 kg N ha^{-1} which was statistically identical with other treatments except with 0 kg N ha $^{-1}$. Plants without N fertilizer showed the lowest biological yield

Harvest index: The effect of nitrogen on harvest index was remarkably influenced by the treatments. The harvest index was significantly higher with 40kg N ha-^{1} compared to that of other treatments except 20kg N ha-^{1}. The lowest harvest index was produced with maximum N dose (80kg ha^{-1}) that was statistically identical to 0 and 60 kg N ha^{-1}.

The result of the present study showed that the best treatment was 40 kg N ha^{-1}. Doses with 20 and 40 kg N ha^{-1} were statistically similar in most of the parameters except grain yield. . From the experimental results it can be concluded that N with doses of 20 and 40kg ha^{-1} were most appropriate for better response in local variety Jatai.

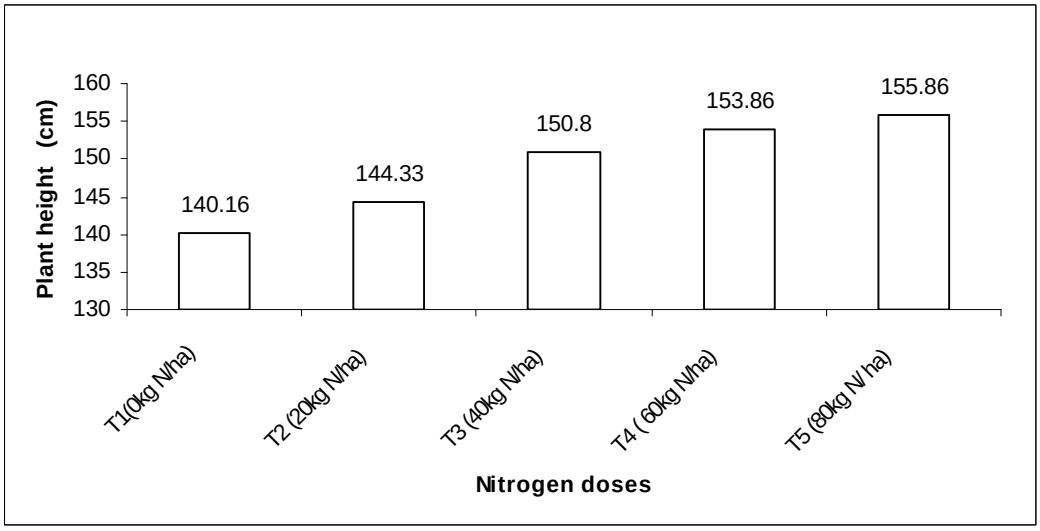

Fig. 1: Effect of Nitrogen on plant height (cm) of rice

Table 1: Effect of nitrogen on yield and yield contributing characters of transplanted local Aman rice.

Nitrogen Dose	Effective Tiller hill^{-1}	Panicle Length (cm)	Filled Grains panicle^{-1}	1000-Grain Weight (g)	Grain Yield (t ha^{-1})	Biological yield (t ha^{-1})	Harvest Index (%)
T_1	7.06b	20.81a	65.92ab	28.54 bc	2.49d	9.14b	27.35c
T_2	8.03ab	20.97ab	70.96 a	28.75abc	3.28 c	10.42ab	31.36ab
T_3	8.65a	21.64a	73.78a	29.34a	4.02a	12.18a	33.05a
T_4	8.46 a	20.26bc	61.03 b	28.11cd	3.13 bc	11.76a	26.19c
T_5	7.70ab	19.31 c	57.85 b	27.44 d	3.03 b	11.94a	25.15c
CV%	12.18	4.84	4.36	3.11	9.01	9.22	9.82
Level of significance	*	**	**	**	**	**	**

In a column, figures with same letter do not differ significantly.
T_1 = 0 kg ha^{-1}, T2 = 20 kg ha^{-1}, T3 = 40 kg ha^{-1}, T4 = 60 kg ha^{-1}, T5 = 80 kg ha^{-1}

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